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Infrared study of tunable magnetoplasmons in graphene

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The Dirac plasmons in graphene are of great fundamental and practical interest due to their very unique properties. We present infrared spectroscopy of 2D plasmon excitations in graphene in high magnetic fields. The plasmon resonance in patterned graphene disks splits into edge and bulk plasmon modes in magnetic fields. Remarkably, the edge plasmons develop increasingly long lifetimes in high fields due to the suppression of back-scattering. The characteristics of the magnetoplasmons, such as their resonance frequency and splitting rate in field, can be well controlled by the dimensions of the patterned structure and chemical doping. This work demonstrates the intriguing physics of magnetoplasmons in graphene as well as their great potential for tunable terahertz magneto-optical devices.

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